* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the liquid crystal display component using a color back light and it which are used for the field sequential electrochromatic display display device which carries out time-sharing actuation of the back light. It is related with the field sequential electrochromatic display display device using the color back light and it which can introduce the light of the light source into a light guide plate, can lose in more detail muddiness of a color with the diffusion plate of the back light irradiated from one front face through a diffusion plate etc., and can irradiate the light of a pure color.
[0002]
[Description of the Prior Art] Although what used twist pneumatic (henceforth TN) liquid crystal, and the thing using super twist pneumatic (henceforth STN) liquid crystal are used, an electrochromatic display display device The thing using STN LCD is excellent in display engine performance, such as contrast and a viewing angle. high [, such as 1/480 duty,] -- carrying out duty actuation -- (-- although based also on an electrical potential difference, 1/16 duty can give an indication with them, and it is not necessary to use a thin film transistor etc., and can manufacture cheaply in TN liquid crystal. [there are many marginal) and pixels and high definition] However, it has the fault that STN LCD is more fairly [a speed of response / than 100ms or more and several ms - about tenms of speed of responses of TN liquid crystal] late.
[0003] On the other hand, the high-speed light source which carries out sequential burning of the color shutter method which can consider the electrochromatic display of a field sequential method and prepares a liquid crystal color shutter in front of display objects, such as Monochrome CRT, the three mono-color CRTs, such as R, G, and B, etc. is used as a back light, and the back light method used for a direct presentation object by using the liquid crystal panel of a high-speed response as a black shutter is considered.
[0004] By such back light method, as shown in drawing 7 as a back light, what light is introduced into from the side attachment wall of a light guide plate 51, respectively according to the light source 52 (52R, 52G, 52B) of R (red), G (green), and B (blue), and is irradiated from the 1 front-face side may be used. The optical diffusion plate 53 is formed so that light may be scattered about on the front face uniformly [the back light which irradiates light through such a light guide plate 51]. And by the field sequential method of a back light method, it has the composition that the light source 52 of R, G, and B irradiates light one by one, for example.
[0005]
[Problem(s) to be Solved by the Invention] The light in which the back light of the type which irradiates the conventional back light through a light guide plate with the back light used for the field sequential method which carries out time sharing penetrates the front face since the optical diffusion plate made granulative like an obscured glass is used for the front face as mentioned above becomes the color which faded whitely. That is, even if the light source is emitting light in the light of pure red, the light which

carries out incidence to a liquid crystal panel through an optical diffusion plate will become the red which faded whitely. Therefore, skillful color display cannot be carried out but there is a problem that a hue is inferior.

[0006] It was made in order that this invention might solve such a problem, and it aims at offering the color back light with which the back light irradiated through the optical diffusion plate in which the light of the light source is prepared on a light guide plate and its front face can also become muddy, and can irradiate the light of a color used for the light source as a light of a vivid color [be / nothing], and the field sequential liquid crystal display component using it.

[0007]

[Means for Solving the Problem] The color back light of this invention consists of a light guide plate into which the light of the light source of two or more colors which emit light in the light of a different color, and the light source of these two or more colors is introduced from a side attachment wall and which is irradiated in the shape of a field from a 1 front-face side, and a light filter sheet prepared in said 1 front-face side of this light guide plate, and the filter section respectively corresponding to the color of the light source of said two or more colors in this light filter sheet is formed by turns.

[0008] Even if the light from the light source which is the cheap back light which is made into the surface light source through a light guide plate by making it this configuration, using for example, a semi-conductor light emitting device as the light source, for example, emits light in a red light becomes muddy whitely with an optical diffusion plate etc., in order to penetrate the light filter part of the red of a light filter sheet, the light of the red of a pure filter is obtained.

[0009] The light source of said two or more colors consists of red, green, and a blue semi-conductor light emitting device, and said light filter sheet can irradiate the vivid color of arbitration red and by forming the light filter of green and blue by turns in the shape of a dot.

[0010] The field sequential electrochromatic display display device of this invention possesses the light filter sheet prepared between a liquid crystal panel, the back light which carries out time-sharing actuation and irradiates the light source of two or more colors, and said liquid crystal panel and back light, and the synchronous circuit which synchronizes actuation of said liquid crystal panel and back light, and the filter section respectively corresponding to the color of the light source of said two or more colors in said light filter sheet is formed by turns.

[0011]

[Embodiment of the Invention] Next, the color back light of this invention and the field sequential electrochromatic display display device using it are explained, referring to a drawing.

[0012] The light source 22 (22R, 22G, 22B) of the light of a color which is different on the side attachment wall of the light guide plate 21 which the color back light of this invention introduces light into from a side attachment wall as the block diagram of the 1 operation gestalt is shown in drawing 1 , and is irradiated in the shape of a field from a 1 front-face side, and its light guide plate 21, for example, red, (R), green (G), and two or more colors that emit light in three blue (B) colors is established. And the light filter sheet 24 is formed in that 1 front-face side, and this light filter sheet 24 has the description in the filter sections 24R, 24G, and 24B corresponding to the color of the light source 22 of said two or more colors being formed by turns, respectively.

[0013] As for a light guide plate 21, a polycarbonate (PC) or acrylic resin with optical, comparatively high transparency etc. is used. The optical diffusion plate 23 is formed in the front face (exposure side) of this light guide plate 21 through the prism sheet which is not illustrated. The optical diffusion plate 23 is what mat-ized the front face of a transparent resin plate (surface roughening), and it is formed so that there may be no optical loss by absorption and an optical diffusion coefficient may become high. Consequently, an appearance-whiteness degree becomes strong. Although not illustrated, the reflecting plate is formed in the side-attachment-walls [other than the side attachment wall with which the light source 22 of a light guide plate 21 is established], and base side, and it is formed so that the light of the light source 22 may turn to a front-face side.

[0014] As for the light source 22, the light sources of a color, such as that by which the light filter was put on front faces, such as light emitting diode (LED), electroluminescent (EL) or an incandescent lamp,

a white fluorescent lamp, and a white halogen lamp, are used. The light sources 22R, 22G, and 22B which the example shown in drawing 1 becomes from LED which emits light, respectively about R, G, and B are established. The number of these light sources 22 is selected so that it may become a suitable illuminance with the magnitude (magnitude of a light guide plate) of the surface light source, and the brightness of the light source 22, and it can also establish two or more light sources 22 of each color every, respectively.

[0015] The color-material film with which the light filter sheet 24 makes a film sheet with transparent PET (polyethylene terephthalate resin), PC, etc. penetrate each light of the light source 22 of two or more colors is prepared in the shape of a dot. For example, if it is the example of the above-mentioned light source 22, the color-material film of R, G, and B is prepared in the shape of a mosaic by a round shape etc., and the light filters 24R, 24G, and 24B of R, G, and B are formed. There is no need that the configuration of light filters 24R, 24G, and 24B is circular, and on a rectangle and as the array is shown in drawing 2 (a) - (c), various arrays with which the filter of each color, such as the shape of the shape of the shape of a stripe and a slanting mosaic and a 3 square-shape mosaic, is located in a line by turns can be used. One side (diameter) is 0.2mm or less still more preferably 0.5mm or less so that the magnitude for every one light filter of this may become a uniform color. Such color-material film can be formed in the above-mentioned transparent film sheet by printing etc. In addition, a black mask may be formed of black printing etc., and the gap section of the color-material film comrade for light filters can also be left transparence in order to make it as bright as possible.

[0016] Although the magnitude of light filters 24R, 24G, and 24B is formed as mentioned above, for example, is not restrained by the magnitude of the pixel of a liquid crystal display panel, as shown, for example in drawing 6 , it can be formed in the relation between each pixel 1a of 1 of a liquid crystal panel, and light filters 24R, 24G, and 24B.

[0017] By according to the color back light of this invention, introducing into a light guide plate the light emitted from the light source, and penetrating the light filter, since the light filter sheet of the color equivalent to the luminescent color of the light source is prepared in the front-face side, although it irradiates as a light of the color which opalescence cut through the diffusion plate, it becomes a pure color, outgoing radiation is carried out, and a hue becomes good dramatically. The part in which the light filter of the three colors will be prepared in a filter sheet on the other hand when three colors of R, G, and B were used for the light source, for example, the light filter of other colors was prepared without penetrating only the part of the light filter of R, when the light source of R was made to turn on will absorb red. Therefore, the amount of luminescence of each color will not penetrate only 1/3 or less area of a light filter sheet, and becomes dark. However, while the problem can be solved and a hue improves dramatically by raising the brightness of the light source or increasing the number of the light sources, a skillful light can be irradiated as a back light.

[0018] Moreover, by using the light source of three colors of R, G, and B for the light source, and using the color-material film of a light filter sheet as the light filter of R, G, and B like the above-mentioned example, the pure mono-color of R, G, and B is obtained, the color mixture also turns into a vivid color, and the back light which irradiates all the colors that were further excellent in the hue is obtained.

[0019] It explains referring to drawing 3 next about an example of a field sequential electrochromatic display display device which used this back light.

[0020] As shown in drawing 3 , the field sequential electrochromatic display display device of this invention consists of synchronous circuits 4 which synchronize actuation of red, green, the back light 2 that carries out time-sharing actuation and irradiates the light source of three blue colors, and a liquid crystal panel 1 and a back light 2, for example while the light filter sheet 24 is formed in a front-face side as mentioned above with a liquid crystal panel 1.

[0021] As shown in drawing 4 , transparent electrodes 13 and 14 are formed in the substrates 11 and 12 which consist of glass, a plastic, etc., and, as for the liquid crystal panel 1, the orientation film 15 and 16 is further formed in the front face. And two substrates 11 and 12 hold a fixed gap, and are stuck by the sealing compound 17 in the perimeter, a liquid crystal ingredient is poured into the gap, and the liquid crystal layer 18 is formed. The polarizing plates 19a and 19b as well as the usual liquid crystal panel are

formed in both the outside surfaces of substrates 11 and 12.
[0022] As a back light 2 is shown in above-mentioned drawing 1 , the light filter sheet 24 is formed in the front-face side. This light filter sheet 24 may be formed directly in contact with the front face of a light guide plate 21 (optical diffusion plate 23), and may be prepared through space. Time-sharing actuation is carried out, and light is emitted in order independently, respectively, or this LED 22R, 22G, and 22B makes two or more colors emit light simultaneously, and carries out luminescence of that color mixture. Luminescence of this LED 22R, 22G, and 22B makes it synchronize with actuation of a liquid crystal panel 1, and carries out luminescence of a desired color. That is, time sharing of the actuation of a liquid crystal panel 1 is carried out to a red viewing area, a blue viewing area, etc., it is displayed on them, and a back light is made to emit light in the color according to the color specification field.
[0023] It consists of combination of an AND circuit and an OR circuit by making the pulse for 1 microsecond from a pulse generating circuit 5 into a reference pulse, and as shown in drawing 3 , a synchronous circuit 4 is synchronizing the actuation circuit 6 and the LED actuation power source 7, so that red LED22R may be turned on, while it turns ON the pixel of the red of a liquid crystal panel 1, when driving a red viewing area.
[0024] Next, relation of timing contemporary with the driving signal of a liquid crystal panel 1 and a back light 2 is explained, referring to drawing 5 (a) and (b), respectively.
[0025] First, the viewing area of R, G, and B of a back light is made to change with the period of 15ms (ms) by a unit of in 5ms, as shown in drawing 5 (a). For example, the synchronous circuit is formed to the timing which the last of the applied voltage to each common signal line is made to turn on similarly about the following G and B as turns on the last about 1ms of the applied voltage to the common signal line of the 5ms of the viewing area of R. Thus, while being continuously checked by looking by changing each field of R, G, and B with the period of about 5ms, respectively without becoming change of 60 cycle extent and each color's flickering, it is too early and each color does not turn into a color which carried out color mixture. Furthermore, even if there is a several ms speed of response of a liquid crystal shutter, the change can be ensured and the function as a shutter is fully demonstrated.
[0026] When R, G, and B of a back light change periodically, drawing 5 (b) is drawing showing the example of selection of turning on and off of the liquid crystal panel in the case of displaying red, blue, and white, respectively, and shows that it can consider as a red display, a blue display, and a white display, respectively by turning ON the part the slash of a liquid crystal actuation wave is indicated to be.
[0027] According to the liquid crystal display component of this invention, since it is irradiating with the back light of two or more colors using the field sequential method of a back light, it is not necessary to use a light filter for a display panel, and a segment electrode is made into one from conventional three, R, G, and B. consequently -- for example, the thing which has the pixel pitch required 0.25-0.3mm by three colors of R, G, and B -- the pitch of 0.1mm -- good -- becoming -- the resolution of a display -- dramatically -- it can raise -- the super-high one -- a minute indication can be given. And since the light filter sheet is prepared in the front-face side of a back light, it can display not in the color which opalescence, such as an optical diffusion plate, cut but in a pure color, and an indication which was dramatically excellent in the hue can be given.
[0028] Although it used the TFT-liquid-crystal panel as a liquid crystal panel, since the above-mentioned example can acquire the property of contrast or a viewing angle highly and can perform high duty actuation by displaying using a STN liquid crystal panel, it can enlarge display capacity and the high definition graphical display of it becomes possible. In this case, since the speed of response of a STN liquid crystal panel is slow, by making TN liquid crystal shutter intervene between a STN liquid crystal panel and a back light, the exposure of the back light to each pixel can be controlled at high speed, and there is also no fear, such as a gap of a color and a blot.
[0029]
[Effect of the Invention] According to the color back light of this invention, brightness falls victim a little by inserting a filter, but it can irradiate in a very pure color also according to the surface light source through a light guide plate and an optical diffusion plate, and an indication excellent in the hue

can be given.
[0030] Furthermore, if it can display in the color which was excellent in the hue according to the field sequential liquid crystal display component of this invention and a STN liquid crystal panel is used, the number of pixels like a dot matrix can display at intervals of a very narrow pixel, and can display many [and] high resolvings. consequently, the super-high ones -- minute graphical display can be displayed by the outstanding hue.

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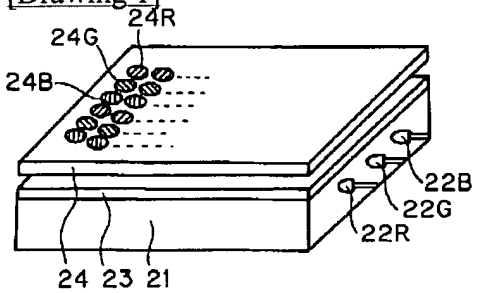
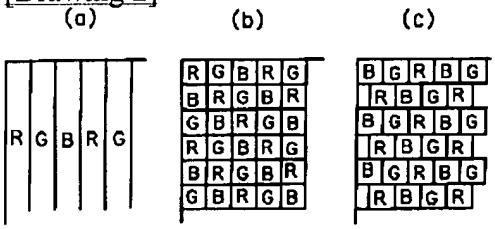
DRAWINGS

[Drawing 1]

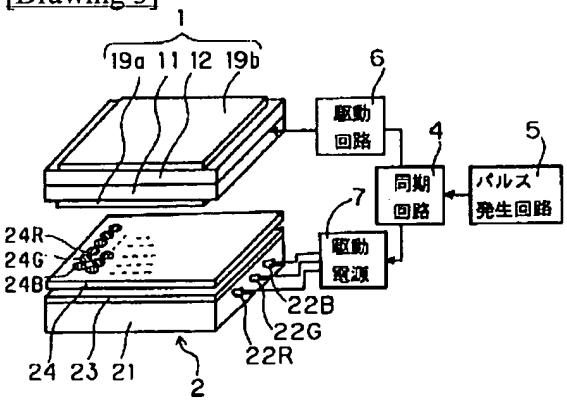


21 導光板　　24R 赤フィルタ
22 光源　　24G 緑フィルタ
24 カラーフィルタシート　　24B 青フィルタ

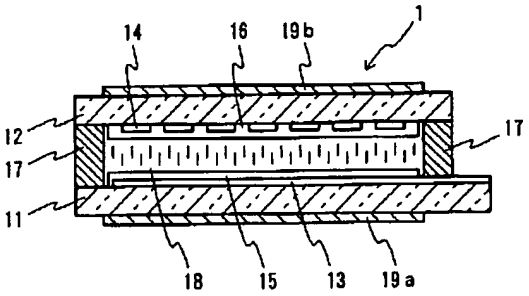
[Drawing 2]



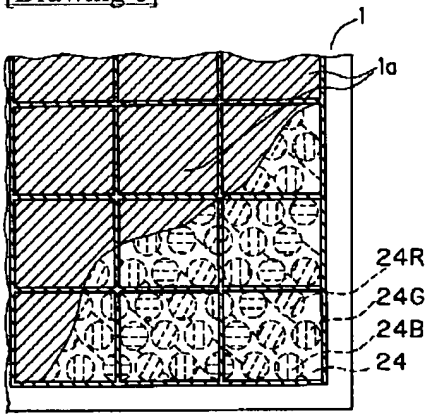
[Drawing 3]



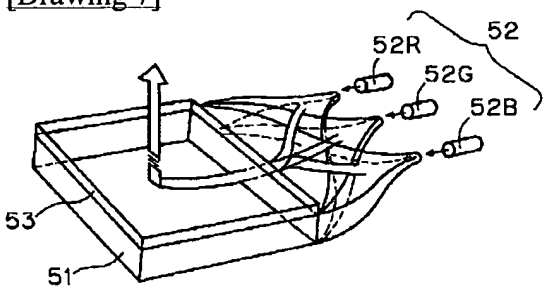
[Drawing 4]



[Drawing 6]

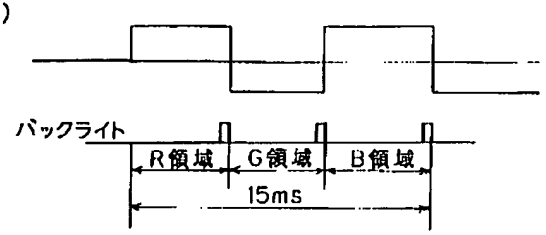


[Drawing 7]

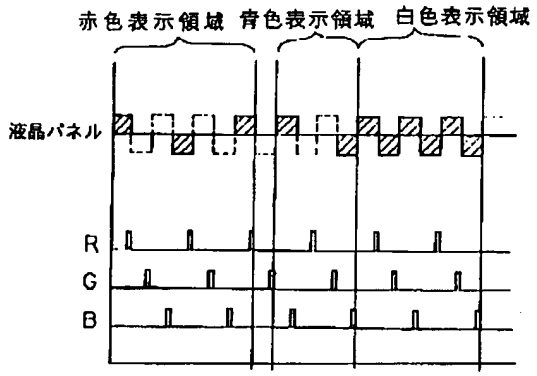


[Drawing 5]

(a)



(b)



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